Current command module 40 conventionally provides an operating current I_{OS1} as a function of a desired force level of the damping force of MR damper 10. To generate operating current I_{OS1}, current command module 40 receives one or more signals 31 as input variables to an algorithm that determines the desired force level of the damping force of MR damper 10. In one embodiment, MR damper 10 is coupled between a vehicle body and a wheel, and the operating condition signals 31 are indicative of various operating conditions of the vehicle (e.g., vehicle speed, driver steering and throttle inputs, vehicle body and/or wheel motions and other signals as would occur to those having ordinary skill in the art. In response thereto, current command module 40 executes one or more conventional algorithms for determining the desired force level of the damping force of MR damper 10 that facilitates an optimal ride and handling of the vehicle under a baseline operating temperature. Such algorithms can include a conventional algorithm for controlling the motion of the vehicle body, a conventional algorithm for controlling the motion of the wheel, a conventional algorithm for controlling a stability and a handling of the vehicle, one or more conventional algorithms for managing damper travel limitations, and other conventional algorithms as would occur to those having ordinary skill in the art.

The result of the execution of the algorithm(s) by current command module 40 is a generation of operating current I_{OS1} at an ampere level to achieve the desired force level of the damping force as a function of a damping velocity of MR damper 10. For example, FIG. 3A illustrates an exemplary force-velocity calibration curve of MR damper 10 for an operating temperature of +20°C as the baseline temperature. As shown in FIG. 3A, the ampere level of operating current I_{OS1} must be 4 amps in order to achieve a desired force level DFL when the damping velocity of MR damper 10 is 1.00 m/s. The generation of operating current I_{OS1} by current command module 40 however does not account for the operating temperature of MR damper 10 being less than or greater than the baseline temperature. Consequently, the desired force level DFL of the damping force may not be achieved. For example, FIG. 3B illustrates an exemplary force-velocity calibration curve of MR

damper 10 for an operating temperature of -20°C. As shown in FIG. 3B, an actual force level AFL_1 being greater than the desired force level DFL is achieved when the ampere level of operating current I_{OS1} is 4 amps and the damping velocity of MR damper 10 is 1.00 m/s under an operating temperature of -20°C. Also by example, FIG. 3C illustrates an exemplary force-velocity calibration curve of MR damper 10 for an operating temperature of +60°C. As shown in FIG. 3C, an actual force level AFL_2 being less than the desired force level DFL is achieved when the ampere level of operating current I_{OS1} is 4 amps and the damping velocity of MR damper 10 is 1.00 m/s under an operating temperature of +60°C.

Temperature detection module 50 and temperature compensation module 60 are collectively directed to an achievement of the desired force level DFL within a wide range of operating temperatures of MR damper 10. Specifically, temperature detection module 50 and temperature compensation module 60 operate to determine and apply a temperature compensation to operating current I_{OS1} to generate an operating current I_{OS2} as a function of both the desired force level of the damping force of MR damper 10 and the operating temperature of MR damper 10. For example, referring to FIG. 3B, operating current I_{OS2} would be generated with an ampere level approximating 3.5 amps when the damping velocity of MR damper 10 is 1.00 m/s under an operating temperature of -20°C to thereby substantially achieve the desired force level DFL. Also by example, referring to FIG. 3C, operating current I_{OS2} would be generated with an ampere level approximating 4.2 amps when the damping velocity of MR damper 10 is 1.00 m/s under an operating temperature of +60°C to thereby substantially achieve the desired force level DFL.

Individual descriptions of various embodiments of temperature detection module 50 and temperature compensation module 60 will now be described herein.

Temperature detection module 50 provides an operating temperature signal OT_{S2} in response to a reception of either an operating temperature signal OT_{S1} that is indicative of a directly or indirectly measured operating temperature of MR damper 10. FIG. 4 illustrates a temperature detection module 150 as one embodiment of temperature detection module 50. Temperature detection model 150 includes a conditioning circuit 151 for receiving operating temperature signal OT_{S1} (FIG. 2) in the form of an ambient temperature signal AT_{S1} that is indicative of an ambient temperature of MR damper 10 (i.e., temperature of the air surrounding MR damper 10 or a system incorporating MR damper 10, such as, for example, a vehicle). When MR damper 10 is employed within a vehicle, ambient temperature signal AT_{S1} can be provided by an outside air temperature sensor, an engine air intake sensor, and other sensors as would occur to those having ordinary skill in the art. In response to a reception of ambient temperature signal AT_{S1}, conditioning circuit 151 conditions ambient temperature signal AT_{S1} to provide an ambient temperature signal AT_{S2} serving as operating temperature signal OT_{S2} (FIG. 2). Such conditioning can include analog-to-digital conversion, signal scaling or conversion operations, analog or digital filtering operations, and other conditioning techniques as would occur to those having ordinary skill in the art. Alternatively, conditioning circuit 151 can receive operating temperature signal OT_{S1} in the form of a damper temperature signal DT_{S1} that is indicative of the internal temperature of MR damper 10 as directly measured within the cavity of MR damper 10 via a thermocouple or the like. In response to a reception of damper temperature signal DT_{S1}, conditioning circuit 151 conditions damper temperature signal DT_{S1} to provide a damper temperature signal DT_{S2} serving as operating temperature signal OT_{S2}.